Geosynthetic Interlayer Functions and I-65 Installation

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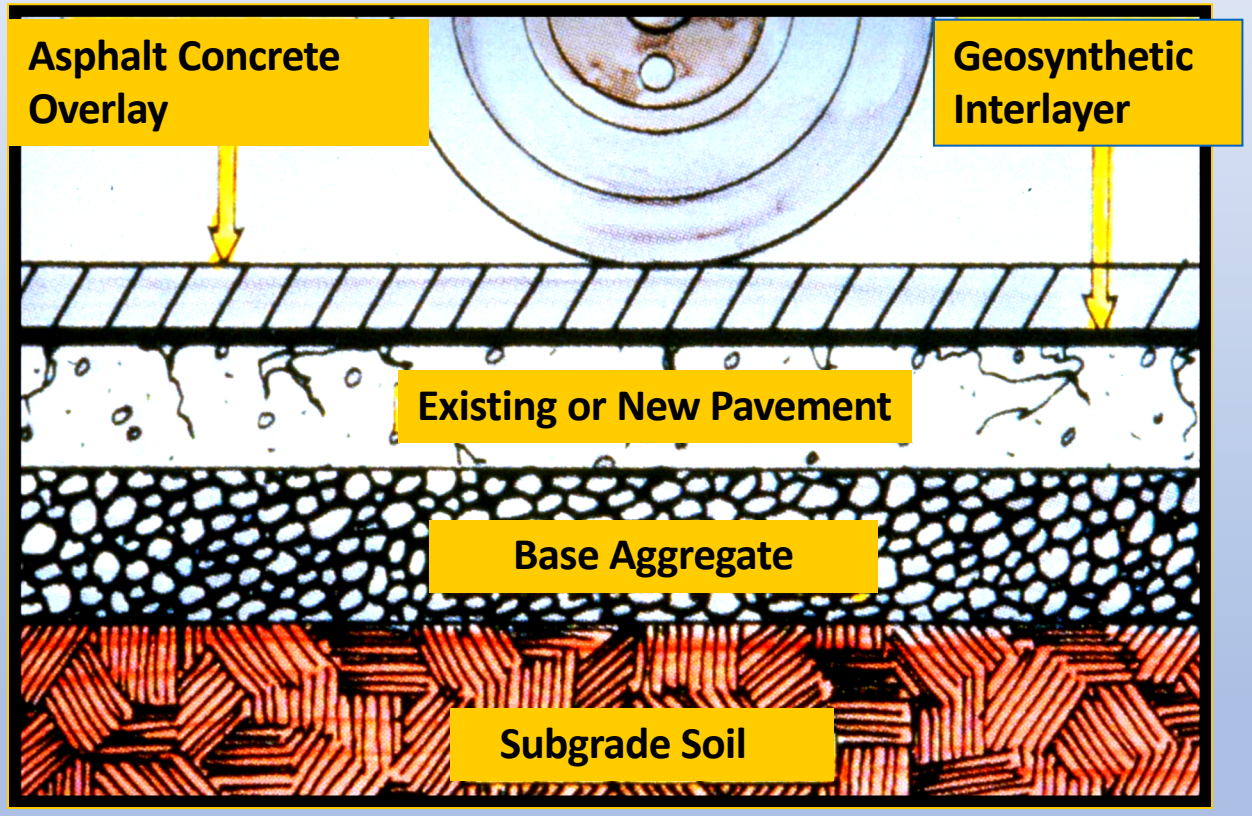
Engineered Paving Solutions

What is a Geosynthetic Interlayer System?



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Paving Fabric Interlayer System Components:

- The most common interlayer, a nonwoven paving fabric, is about 4.1 ounces per square yard, needle-punched nonwoven, and made of polypropylene and polyester fibers.
- This interlayer system becomes field saturated with asphalt cement during installation.

First, a uniform asphalt cement tack coat of 0.25 gallon/sq. yd. (0.9 liter/sq. m.) is sprayed onto a clean dry pavement surface


Next, paving fabric is installed
immediately onto the warm tack coat

Freshly installed paving fabric system, ready to receive an asphalt concrete overlay.

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Then, at least 1.5 inches(38mm) of compacted asphalt concrete is laid over the fabric. The heat of the overlay reactivates the tack coat moving it upward to saturate the fabric and to bond to the overlay.

This tack coat will not produce a waterproofing membrane and may result in a failed system due to lack of proper bonding.

Possibly the correct quantity, but uneven application

If used, emulsions will often run off high points and pond in low areas, resulting in poor, spotty paving fabric saturation.

As shown in this pavement core, the result is a well-bonded system with a thick asphalt saturated paving fabric interlayer.

Paving Fabric Interlayer Functions:

- A stress absorbing interlayer
- A pavement moisture barrier membrane

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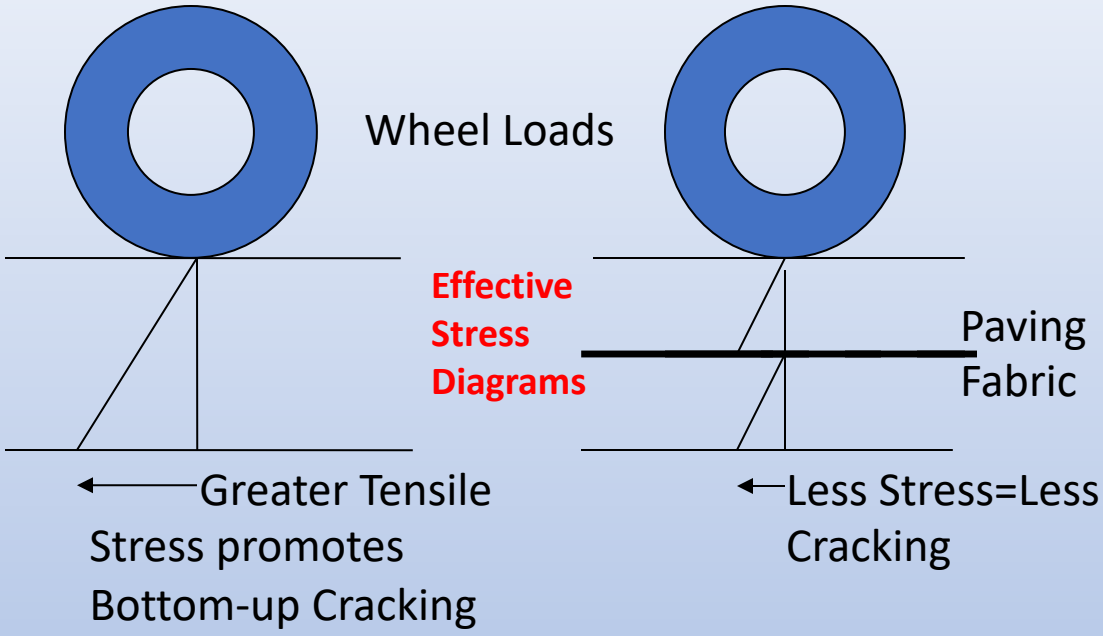
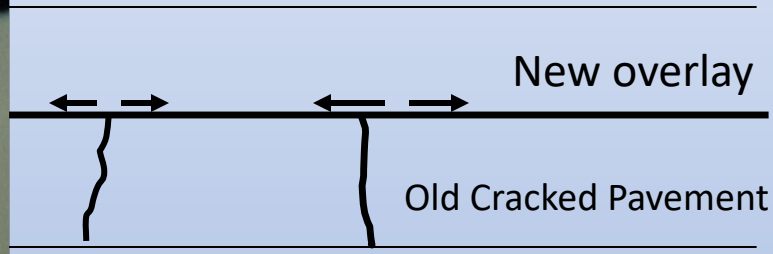
Stress Absorption Retards:

- Fatigue cracking due to pavement flexure
- Reflective cracking due to ongoing stresses around underlying pavement anomalies



Effective layering, due to the paving fabric interlayer, reduces tensile stress in the base of each layer due to pavement flexure, as shown on the stress diagrams above. This reduces bottom-up tensile crack development and **increases fatigue life.**

The thick, asphalt-saturated fabric interlayer also absorbs and dissipates stresses due to underlying existing cracks or joints to **retard reflective cracking.** The thicker the interlayer, the better.



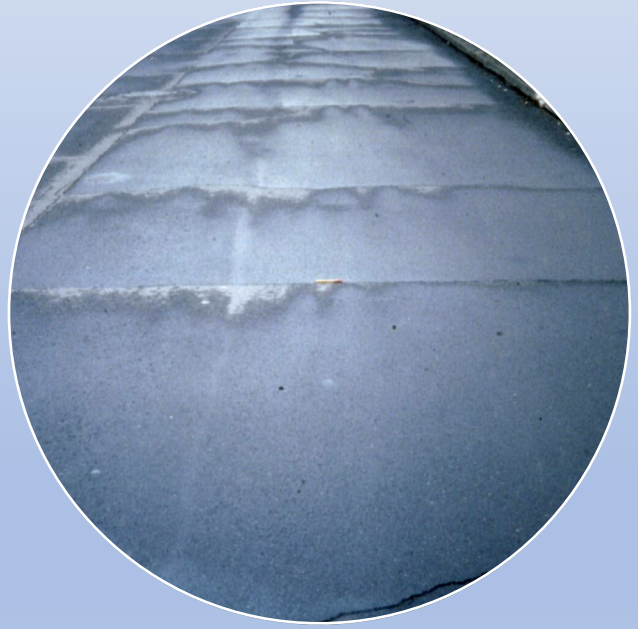
However, excessive joint or crack movement should be stabilized first and/or redundantly treated with a heavy duty self-adhering geosynthetic strip membrane interlayer.

Documented Field Performance

- Maxim Synthesis Report--TRB
- Manufacturer Tech Notes and Case Histories
- CALTRANS and Other States' Research
- Greenville County, South Carolina Study
- General Findings—For crack retardation, the inclusion of a Paving Fabric Interlayer:
  - ➢ *Provides equivalent performance as an additional 1.2 to 1.5inch AC overlay thickness*
  - ➢ *Or, applied to current designs, it doubles the life of a typical asphalt concrete overlay*

NOTE: This is accomplished at 1/3 to 1/2 the overlay cost

Georgia DOT performed a trial to test the effectiveness of Paving Fabric Interlayers over PCC joints, to retard reflective cracking. The following slide shows the results.



Curves overlaid to compare performance. Note doubling of pavement life or, performs like adding a thicker asphalt cement concrete overlay.

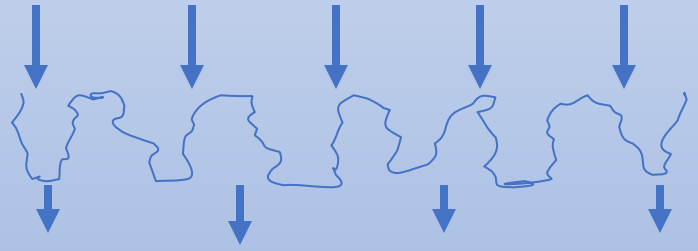
Paving Fabric Interlayer System As A Pavement Moisture Barrier

The moisture barrier function is just as important to pavement performance as crack retardation and, both enhancements are additive

WATER Is The Root Cause Of Most Pavement Deterioration

The Major Source of Water in Pavement Sections:

Seepage Through Pavements



Into Road Base Layers and Subgrade

Precipitation Infiltration Coefficients for Typical Pavements

- PCC-- .50 to .67
- ACC-- .33 to .50
- Precipitation X Coefficients = Infiltration Amount Through Pavements

(Federal Highway Administration Study)


Then, once cracked, a pavement can infiltrate almost 100% of rainwater (infiltration coefficient near 1.0)

Several days after a rain this base is still saturated and pumping out trapped water and subgrade fines (note early slab cracking).

Effects of Moisture In Pavement Sections

- Softens Subgrade Soil/Promotes Base Aggregate Contamination and Failure
- Effects of Free Water—Pumps Out Fines
- Effects of Pore Water Pressure—Loss of Support
- Effects of Freezing-Ice Expansion, Heaves the road and can form ice lenses
- Water infiltration swells clays and drying shrinks the clays for expansive soil damage
- Moisture swings also crack treated subgrades and bases

“Structural Credit” For Drainage

By AASHTO pavement design, the more often you have water in the pavement section, the weaker the structural layers. Using AASHTO drainage coefficients, the better the drainage, the higher the strength you may assign to unbound aggregate bases.

AASHTO Base Drainage Definitions

Quality of Drainage	Water Removed Within:
Excellent	Two hours
Good	One day
Fair	One week
Poor	One month
Very Poor	Will not drain

AASHTO Recommended Drainage Coefficients For Flexible Pavements

Drainage	Lower Rainfall Area	High Rainfall Area
Excellent	1.25	1.20
Good	1.08	1.00
Fair	0.90	0.80
Poor	0.70	0.60
Very Poor	0.58	0.40

Drainage coefficient X Structural coef. = Base Structural Number

Traditional Attempt to Solve Moisture Problems

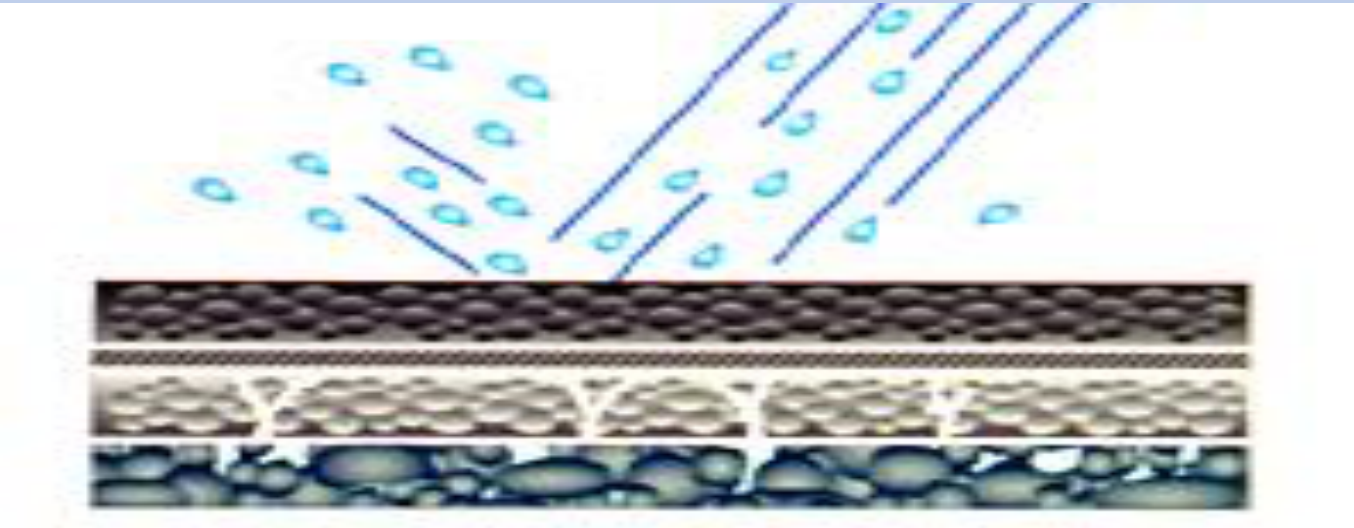
Highway Edge Drains

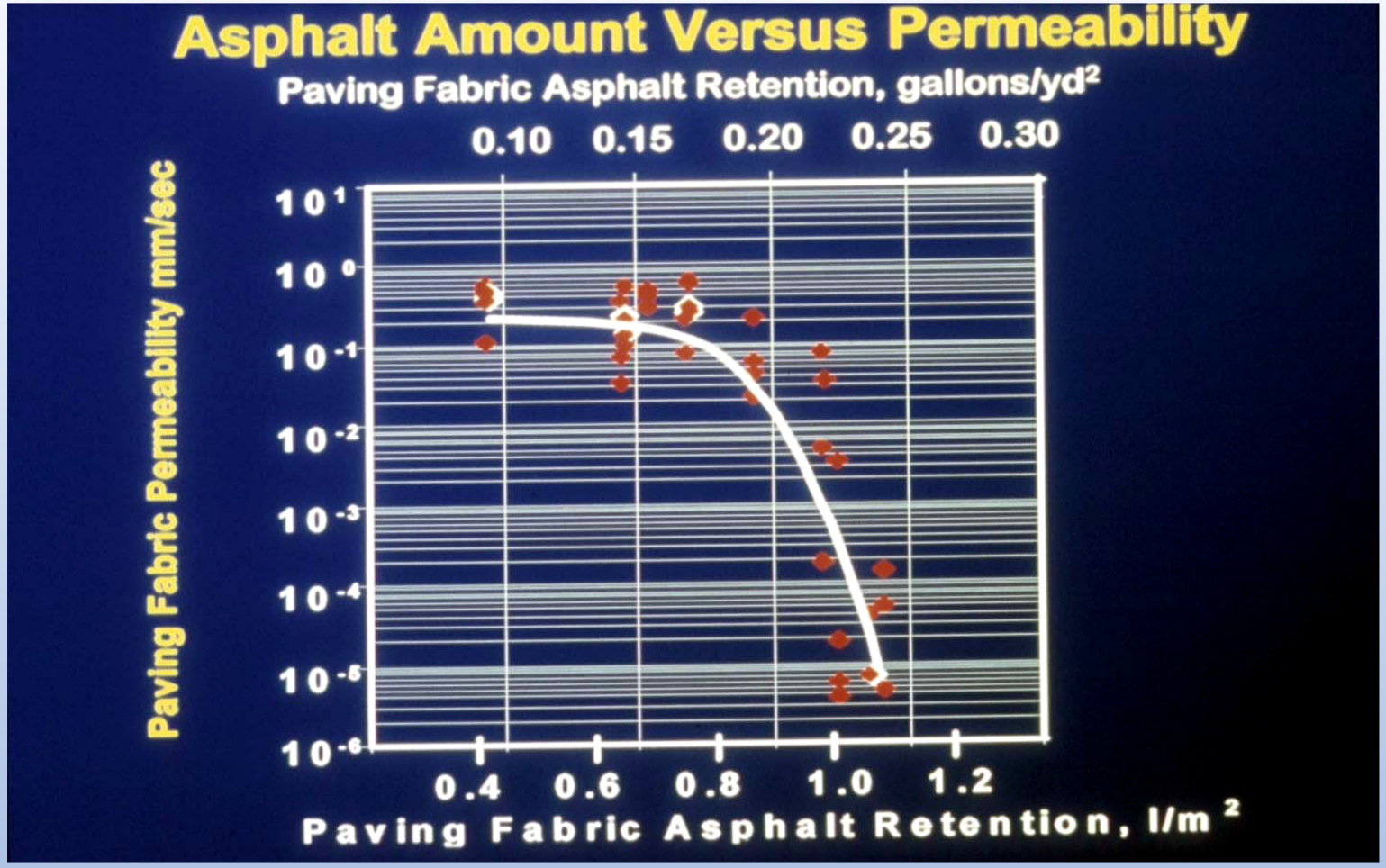
However, very few existing pavement bases would adequately drain due to contamination. Many of the new pavement base gradations in use today cannot effectively drain either.

The Alternative to Pavement Drainage:

Cap the pavement with a moisture barrier, like a paving fabric interlayer.

➔If you don't let the water in, you don't have to drain it.





Asphalt Tack Amount versus Paving Fabric Permeability From Laboratory Testing—It is Important to have Adequate Tack Coat

Web Available Research Studies on Paving Fabric Performance

- --Reference TRB Online Circular, EC006, found at http://gulliver.trb.org/publications/circulars/ec006.html (Summary of this study is on www.propexglobal.com website under Technical Resources as Tech Note 4)
- -- Nonwoven Paving Fabric Study, found at www.gmanow.com
- --Several other references reside on manufacturer websites

Interlayer Selection Criteria

- Pavement condition to be addressed—moisture, cracking
- ESAL loading of the pavement
- Type of pavement foundation
- Pavement surface for interlayer placement—milled or not
- Performance in similar situation case histories
- Cost effectiveness of the interlayer vs. traditional options
- Interlayer depth for potential future millability
- Future recyclability as RAP back into new asphalt concrete
- Interlayer survivability through construction and in service

From this analysis comes the interlayer design and project specification

IN DOT I-65 Interlayer Selection Criteria

- Proven pavement performance in comparable projects
- Thick stress relief layer
- Proven competent moisture barrier
- Proven millability and recyclability—max tear strength
- Cost effective solution
- Proven construction and long-term survivability

Product selected:

Petromat Enviro